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for the growth and distribution of the fishes' food, by the bridging over of the cold current.

The effect of the wind on the modification of the northern boundary of the Gulf Stream was pointed out, and it was shown that it had been moving towards the New Jersey coast at the rate of sixty miles per year. The pilot charts of the North Atlantic coast, in which were given the direction and velocities for the last three years, were exhibited to support this view. Further, the influence of these changes in the conditions in temperature and moisture upon our climate were pointed out and some explanations offered.

GEOLOGY AND PALEONTOLOGY.

The Earthquake in Japan.—In a recent letter to the New York *Tribune*, Mr. Kairiyama, a Japanese resident of New York, states he has received letters from Japan containing many particulars of the terrible earthquake in that country, which took place October 28. The section chiefly afflicted was the great island of Hondo, which is the main island of the Japanese empire, embracing many provinces. The surface of the ground at the time of the disturbance was terribly shaken. No person could stand. Houses were instantly thrown down; fire instantly raged, roasting the imprisoned victims. The shocks took place at intervals during four days, and varied from 100 to 600 in different localities. Relief funds are being subscribed in this and other countries.

The London *Daily Graphic* says: "Twenty-six thousand five hundred people were killed and wounded; 90,000 houses destroyed; 200,000 people homeless. Not even the distance between them and us, which robs the facts of so much of their import, the figures of so much of their meaning, can deprive them of all. There are people starving, too; and this is a tangible ill, which we may attempt to lessen as well as to appreciate. An appeal has been made by the Japanese people to our charity. The disaster which has overtaken them is not within human power to foresee or to prevent; but some of the consequences it is only human to attempt to alleviate."

The steamer China, which recently arrived at San Francisco from Hong Kong and Yokohama, reports that, while the steamer was between Hong Kong and Yokohama on the return trip to San Francisco, an imposing sight was witnessed by the passengers and crew.

The great earthquake at Yokohama had taken place a short time previous, and many of the islands in the Yellow Sea were in a state of volcanic disturbance. About seven o'clock on the evening of Nov. 3d, the China was passing the Aleutian Islands, in Van Diemen's Straits, when, suddenly, the island of Suson seemed all ablaze, and flames and lava shot up a distance of 800 feet into the air.

The steamer was twelve miles distant, and the spectacle, as seen from her decks, was grand. The night was dark, and the eruptions from the crater of the volcano took place at intervals of about fifty seconds. They were accompanied by detonations, which, in the distance, sounded like bombs exploding, and, after each discharge of molten lava and flames, the burning fragments descended like sparks from a gigantic Roman candle.

The American bark Hesper, also lately arrived at San Francisco from Kobe, Japan, after an excellent passage of twenty-seven days, reports a graphic account of an experience with a submarine volcano, hot sea-water and sulphurous gases.

Capt. Sodergren states that, about 6.30 A. M., on October 28, while lying at anchor in Kobe, the bark received a sudden shock that caused the masts to strain and crack. Some of the standing rigging snapped like a piece of twine, and all hands were thrown from their feet. The vessel pitched heavily, and caused one of the cross-trees to break from its fastenings and fall on deck. The waters became still an hour later, and the bark put to sea.

Early on the morning of October 30, when about seventy-five miles off the Japan coast, the bark was almost thrown on her beam ends by the sudden eruption of a submarine volcano. The water became so hot that, when a sea was shipped on deck, the crew took to the rigging. The heat became so intense that the pitch in the deck was melted and the seams opened.

"Great blasts of hot air, with a strong sulphurous smell," said the captain, "would come up from the breaking surface of the ocean and almost suffocate us for the moment. Then the membrane of the nostrils became irritable, causing us all to have a fit of sneezing. This phenomenon lasted for several hours. I have had all I want of the Japan side for some time to come."

Prof. Horace Briggs, of Buffalo, who was in Japan at the time of the earthquake, says immense crevices, from which hot mud and steam escaped, were to be seen in all directions.—*Scientific American*, Dec. 19, 1891.

The Report of the Minnesota Natural History Survey for 1889,[1] an 8vo. of 234 pages, has, for its contents: Summary Statement for 1889; Report of Field Observations made in 1888, in 1889, N. H. Winchell; American Opinion on the Older Rocks, A. Winchell; Additions to the Library of the Survey since 1884; List of Publications of the Survey.

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[1] The Geological and Natural History Survey of Minnesota. Eighteenth annual report for the year 1889. N. H. Winchell, State Geologist.

This report gives an idea of the progress that is being made in the intricate geology in the northeastern part of the State, and of the economic resources that are being developed there. Mr. N. H. Winchell's field observations confirm the views set forth by Irving, Bonney and Lawson, and the conclusions published by the Minnesota Survey, to the effect that the Huronian System, as now defined and understood by the Canadian geological reports, really embraces two or three formations; that one of them is the true Huronian of Murray; another is the Kewatin of Dr. A. C. Lawson, containing the iron-ores at Tower, Minn.; and another is the series of crystalline schists which Dr. Winchell calls the Vermilion series. They are distinctly separated by lithology and unconformities that have been noted from Vermont to Minnesota, and can no longer be included under a single term.

Report of the Geological Survey of Texas, 1889.[1]—The first annual report of the Geological Survey of Texas is presented in 8vo. form of 410 pages, with maps, sections and plates. The general reports of the State geologist and the several field geologists is followed by important papers on the economic geology of the State. Mr. Penrose reports on the iron ores of Eastern Texas, which necessarily includes an account of the general geology of the Gulf Tertiary. Mr. Hill discusses the economic uses of the Cretaceous rocks. Messrs. Cummins and Tarr are studying the problems of the coal, the gypsum and the salt, which are found in the Carboniferous period, and contribute papers on these subjects. Mr. Von Streeruwitz gives a preliminary statement of the geology of Trans-Pecos Texas, with reference to mining interests, and Mr. Comstock a preliminary report on the central mineral region of Texas. Both of these papers contain valuable information concerning the older rocks of the State.

Infusorial Earths of Pacific Coast.—In a recent paper (*Am. Journ. Sci.*, Nov., 1891), Mr. A. M. Edwards has described seven new fluviatile, fossiliferous deposits from Oregon, California and Washington, four of which are from the western side of the mountains, one from the gap, and one from the east; proving that the fresh-water deposits are not confined to the eastern slope, as Bailey had supposed. Mr. Edwards further states that the geological age of a fresh-water Diatomaceous strata cannot be determined by means of the microscope unless they are proved by other evidence to be of greater age than the present period. Enough is known of the habitat of certain species to make it easy to tell whether the deposit has been made in pond, lake, river, marsh, bay or ocean.

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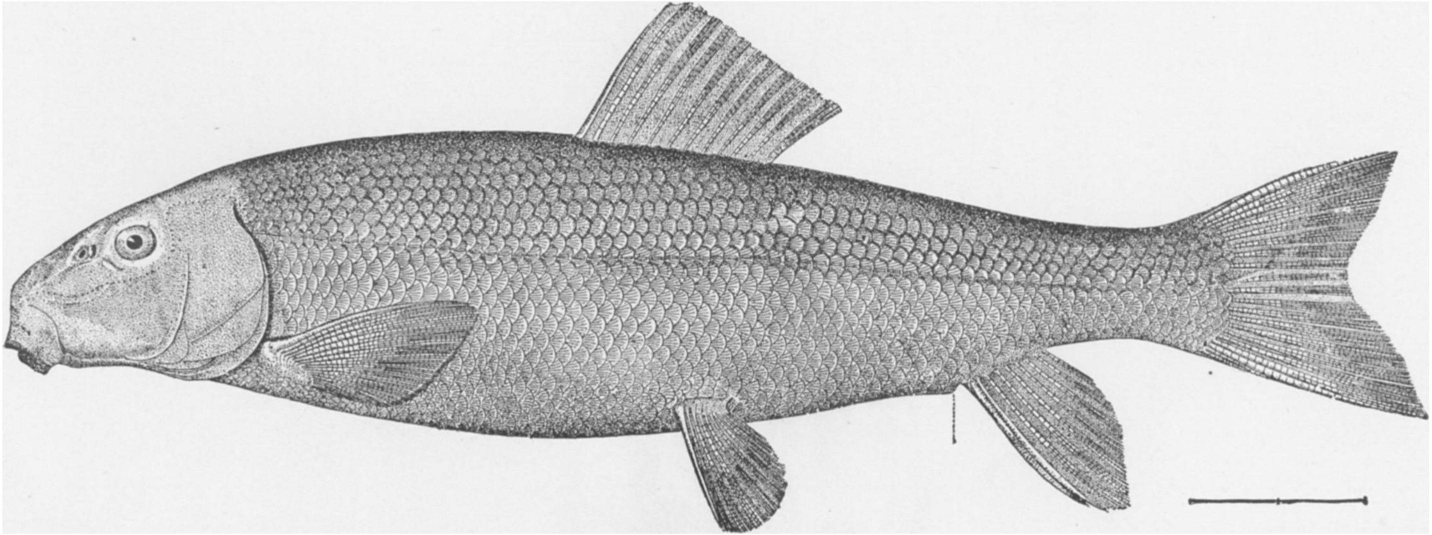
[1] First Annual Report of the Geological Survey of Texas, 1889. E. T. Dumble, State Geologist.

On the Relationship of the Plistocene to the Pre-plistocene Formations of the Mississippi Basin South of the Limit of Glaciation.—In the *American Journal of Science,* May, 1891, is published a paper, the joint production of Mr. T. C. Chamberlin and Mr. R. D. Salisbury, on the relationship of the Loess and the Orange Sand south of the limit of glaciation. The deposits investigated by the writers are included between the parallels of 35° and that of the northern limit of the Mississippi Basin. Throughout much of this territory the loess lies upon the glacial drift. It may be traced across the limit of the drift from north to south. The continuity is complete, and the character of the formation is the same on both sides of the line which marks the limit of ice advance. North of the limit, the evidence, in the judgment of the writers, is conclusive that the loess belongs to the closing stages of the first glacial epoch. If, therefore, the age of the loess which covers the drift be first glacial, the age of that which lies south of the drift, in the area under discussion, is likewise first glacial.

Between the relationship of the till north of the limit of glaciation and the relationship of the loess to the residuary earths of the Paleozoic rocks immediately outside the drift there is an important difference. The presence of a weathered and highly-oxidized zone, subjacent to the loess, south of the drift-limit, is as conspicuous as its absence to the north. This oxidized zone is the upper surface of the residuary earths, and clearly indicates the existence of a long interval between the loess and the residuary earths beneath.

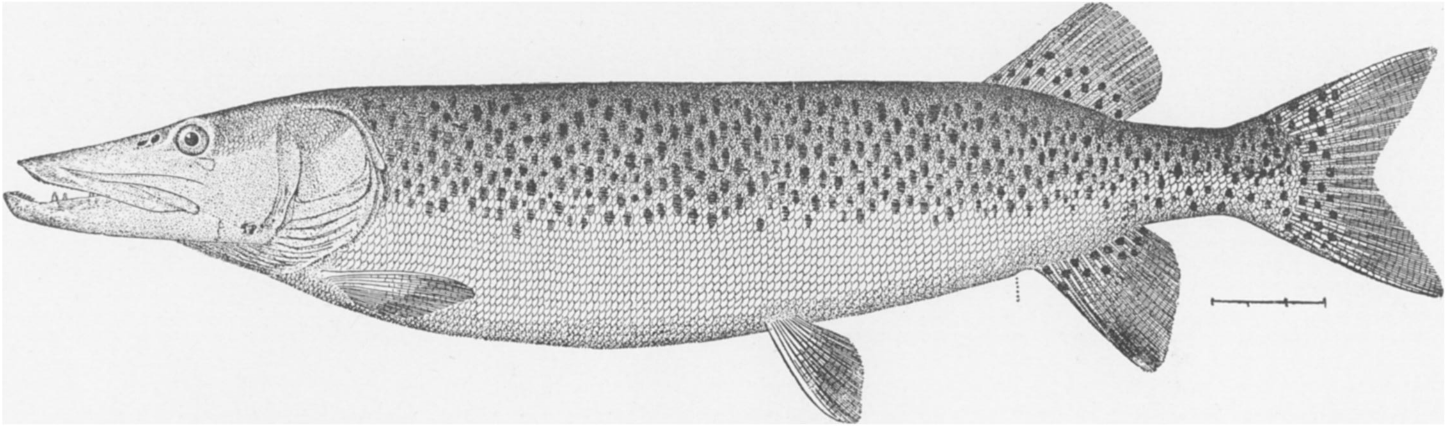
Beneath the loess, south of the limit of glaciation, lie the series of gravels and sands known as the Orange sands. It is a peculiarity of the distribution of loess, that elevations within the area of its occurrence seem to be no obstacle to its presence. The same may be said of the gravel. From their relative position it is evident that the latter is the older of the two. That it is much older is shown (1) by a zone of oxidation between the loess and the Orange sand; (2) by a marked unconformity when the loess covers a hill, indicating a long period of

PLATE II.



Myxostoma macrolepidotum Les.

PLATE III.



Esox nobilior Thomps.

pre-loessial erosion; (3) by chemical changes in the sands and gravels, due to long exposure to atmospheric agencies.

Further evidence is adduced to show that the Orange Sands cannot be referred to the first episode of the glacial epoch, nor to the interval between the two glaciations of the first glacial epoch—they are undoubtedly pre-plistocene; and the conclusion is given as follows:

"In the light of the foregoing evidence, we find but one conclusion possible respecting the age of the Orange Sand. In six States, at least, it is true that, beneath the loess and above the Orange Sand, there is an old surface so deeply weathered and oxidized as to indicate a long period of exposure before the deposition of the loess. . . . . Everywhere below this horizon there is an absence of material which can be referred to a glacial origin; while, above this horizon, the loess and other fluvial deposits contain material of glacial derivation. *This old surface we hold to be the dividing plane between the Plistocene and the Pre-plistocene formations.*"

Cretaceous Fossils from Syria.—A bulletin of the American Museum of Natural History, issued December, 1891, contains observations on some Cretaceous Fossils from the Beyrut district of Syria, in the collection of the Museum, with descriptions of some new species by R. P. Whitfield. A tabulated list shows that, of the 175 species, 93 are Lamellibranchiates and 82 are Gastropods, from six distinct beds of Cretaceous rocks, the lowest of which is above the zone of the *Cidarites glandarius* Lang., below which comes the Jurassic beds of Mejdel el Shems.

The Age of the Staked Plain of Texas.—Mr. R. T. Hill has stated that the superficial beds of this large area (10,000 square miles) are of Cenozoic age. Mr. W. T. Cummins states (First Annual Report of the Geological Survey of Texas) that they are of light-colored calcareous material, and he calls them the Blanco Canyon beds. Dr. E. T. Dumble, director of the Geological Survey of Texas, having sent me some vertebrate fossils from Blanco Canyon, I have determined them as follows: A new species of Equus (*E. simplicidens* Cope) is associated with a Mastodon with molar teeth of the *M. angustidens* type, and a new species of land tortoise, *Testudo turgida* Cope. The association of the genus Equus with the Mastodon of the angustidens type has not been observed previously on this continent, the latter ceasing with the Loup Fork beds, and the former commencing with the Equus bed. The Blanco formation may thus be regarded as between the two in age, and as filling a gap in the geologic series hitherto vacant.—E. D. COPE.

Boulder Trains and Boulder Belts.—Mr. T. C. Chamberlain recognizes two leading types of glacial boulders: (1) boulder trains, and (2) boulder belts. Boulder trains originate from knobs or prominences of rock which lay in the path of the glacial movement. They lie in the line of glacial movement, but not strictly parallel to it, but rather in radiating lines, and may be called boulder fans. The boulders are usually of a single kind, growing smaller and more worn as traced away from the parent knob, and are mingled with the underlying drift. The boulder belts lie transverse to the direction of glacial movement, are composed of stones of different kinds, from distant sources, and do not mingle deeply with the underlying drift. These boulder belts coincide closely with terminal moraines, which suggests that they were deposited by the margin of the ice that formed the moraines.—*Bull. Geol. Soc. Am.*, Vol. I., 1889.

Geological News.—General.—Elk Lake, discovered by Mr. Chambers, July 6, 1872, is officialy announced as the ultimate source of the Mississippi River.—*Am. Geol.*, Nov., 1891) —— According to J. C. Branner, Crowley's Ridge, in Eastern Arkansas, is not an upheaval, but is the result of an erosion along both sides of it. The ridge is capped with Tertiary, while the valleys, both east and west, are covered with material of a later date. (Report Geol. Surv. Ark., 1889.)——Mr. Ellsworth Call's studies of the geology of Eastern Arkansas have shown that divisions within this area must be based upon stratigraphic and petrographic, rather than upon paleontologic data. The paucity of fossil remains to preclude a classification based upon faunal contents. (Report Ark. Geol. Surv., 1889.)

Paleozoic.—Mr. G. F. Matthew is of the opinion that more than one horizon of life is represented in the assemblage of forms known as the Olenellus Fauna. This appears to be indicated by the fauna of Washington County, N. Y., the source of the Emmons types, which has been recently studied by Mr. Walcott. (*Am. Geol.*, Nov., 1891. ——A series of papers on the Paleontology of the Ohio Valley, by J. F. James, is being published in the *Journal of the Cin. Soc. Nat. Hist.*, 1891. The first one treats of Plantæ and Protozoa. The other groups will be taken up in regular order.——A study of the rocks at Point Pleasant, in Southern Ohio, leads Mr. James to the conclusion that there is no more reason for assigning them to the Trenton than there would be in making a similar disposition of the lowest beds at Cincinnati. This is contrary to opinions hitherto held, as they have been generally referred to the Trenton. Mr. James considers them part of the series known as the Cincinnati group of Meek and Worthen, for which Walcott has proposed the name Cincinnati Shale and Limestone in the Hudson Terrane. Mr. James remarks, in this connection, that there is no good reason to say that the Trenton outcrops at the surface in any locality within the borders of Ohio. (*Journ. Cin. Soc. Nat. Hist.*, July, 1891.)

Mesozoic.—M. Philippe Thomas reports valuable deposits of phosphate of lime in the cretaceous marls of Tunis. The most important are located in the southwestern part of the high plateaus. (*Rev. Sci.*, Nov., 1891.)——The left ramus of a mandible of *Homoeosaurus major* was exhibited by Mr. Boulenger at a recent meeting of the London Zool. Soc. The specimen was taken from the Forest Marble in Wiltshire. (Proceed. London Zool. Soc., Feb., 1891.)——A recent paper by Mr. Lydekker, on *Ichthyosaurus tenuirostris* concludes as follows: "It appears from the recent researches of Dr. E. Fraas that the type of *I. acutirostris* Owen has smooth, carinated teeth like those of *I. platydon*, so that this species should be transferred to the Platyodont group, which it has been proposed to raise to generic rank as Temnodontosaurus. This leaves the name *I. quadriscissus* as the one best applicable to the other specimens catalogued as *I. acutirostris.* Moreover, Dr. Fraas considers that *I. zetlandicus* Seeley is identical with quadriscissus; and we are disposed to doubt the right of separating *I. longirostris* Jäger (non Owen) from the same. Finally, we observe with satisfaction that Dr. Fraas is disposed to consider the American *Baptanodon* as inseparable from *Opthalmosaurus* of the English Oxford and Kimmeridge Clays, of which such a fine series has been recently acquired by the British museum." (Geol. Mag., July, 1891.)

Cenozoic.—Mr. Crawford has collected a series of facts which indicate that at least two or three mountain ranges in Nicaragua were deeply covered by ice during a glacial epoch contemporaneous with that which existed in the North American continent. (Am. Geol. Nov., 1891.)—According to R. E. Call the silicified woods of Eastern Arkansas are all of Tertiary age. They are silicified lignite, derived from the beds of Eocene clays that underlie the sands and gravels in which they commonly occur. (Am. Jour. Sci., Nov., 1891.) T. M. Boulanger has described a new extinct turtle (*Testudo microtympanum*), probably from Mauritius. Its principal distinctive features are the very small tympanic cavity and the backward prolongation of the palatines and vomers, the latter forming a suture with the basisphenoid. (Proceeds. Lond. Zool. Soc., Jan., 1891.)——Two species of Procoptodon are described and figured by Mr. Lydekker in the Quarterly Journal of the Geological Society, Nov., 1891. These fossils are two mandibular rami, and they were obtained from the claybeds near Miall Creek, on the Northern frontier of New South Wales. They have been referred provisionally to *P. rapha* and *P. goliah*.

MINERALOGY AND PETROGRAPHY.[1]

Petrographical News.—The eruptive rocks of Velay, Haute Loire, France, in the order of their age are basalts, trachytes and trachytic phonolites, augite andesites, porphyritic basalts, nepheline phonolites and nepheline basalts. Termier,[2] who describes them, gives but a few brief notes on each type. The younger phonolites form the larger part of the hill. They contain aegerine in light-green porphyritic crystals, and in microlites. At the south-east of St. Pierre-Eynac are tertiary clay slates cut by dykes of phonolite, whose tiny veins penetrate metamorphosed phases of the clastics, and are thus consequently regarded as the agents producing the alteration. The rocks representing the first stage in the alteration consist of granitic debris, in which secondary opal has been deposited around the feldspar and quartz fragments. In some instances, in addition to the opal there have been formed also secondary quartz and calcite, the former as a fibrous rim around the grains. In more intensely changed phases, the slate is traversed by veins of phonolite, whose contact with the sedimentary rock is not visible, since on both sides of it the material of the phonolite has thoroughly impregnated the slate. On the other hand the phonolite of the veins contains sphene, but no augite, while the normal rock contains an abundance of aegerine, but no sphene. In the final stage all the quartz of the slate has disappeared, and the rock is comprised principally of opal, serpentine and clay (halloysite ?), with pleonaste, colorless augite and hornblende as new products. The alteration is thus a silicification. In other, more rare cases, it is a feldspathization.—Hutchings[3] has recently studied the material of which slates are formed, having examined for this purpose, clays and micaceous sand-

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[1] Edited by Dr. W. S. Bayley, Colby University, Waterville, Me.

[2] Bull. d. Serv. d. l. carte Geol. d. Fr. No. 13, 1890.

[3] Geological Magazine VII, 1890, p. 264 and 316, and Ib. 1891, p. 164.